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ARTICLE | #2

Title
Assessment and Feedback: Essentials for an Effective Online Learning of Histology

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Abstract
This review article will highlight the importance of online assessment and feedback in the effective implementation of the medical curriculum, in general, and of histology, in particular. Histology, a basic discipline in medical curricula, is witnessing a continuous increase in its online resources and a massive enrollment capacity. Consequently, for online teaching to be effective it needs periodic assessment and feedback, especially with the expansion of web based instruction delivery methods.

Feedback and assessment are inextricable components of the effective implementation process of a medical curriculum, especially when using online learning modalities. In a course component such as histology, which witnesses a continuous increase in online resources and massive registration, assessment and feedback are important factors influencing student's approaches to learning as well as the outcomes (Jurjus, et al, 2013, Evans et al, 2014). Histology is normally regarded as building in a well-organized timely process starting with cells towards more complex tissues to organs. In such a course, which is mostly a visual science, online assessment and feedback are feasible and essential to drive learning and assess the desired outcomes. Actually, with contemporary progress of the internet, more and more distance and online education is taking place. In the USA, nationwide, online enrollment rates in higher education are expanding at a much faster pace than traditional classroom enrollment growth. There was a 17% increase between 2008 and 2009 in online enrollment compared to a 1.2% increase in the overall enrollment in higher education during the same period. In brief, web-based technology has noticeably transformed the learning and teaching environment, particularly in medical sciences. The number of medical schools as well as the number of students enrolled has remarkably increased (Allen and Seaman, 2010).

In most histology courses, students born in the last 25 years make up the current cohort of undergraduate students. These students have been shown to embrace technology and are part of the force driving institutions to increase their online course offerings (DiLullo et al, 2011) with this trend being projected to continue for a number of years (Allen and Seaman, 2010). With this projected growth it is important to ensure that online courses meet the set objectives by developing reliable online assessment and feedback systems.

Advocates of online learning have reported it to be more effective than traditional face-to-face experience by potentially eliminating barriers of various types (Swan et al, 2000; Jurjus et al, 2013) whilst increasing convenience, flexibility, customized learning, and facilitating assessment and feedback.

In such a modern era of learning, traditional testing methods do not seem to fit well at all times and the trend worldwide is to turn to online methods, especially in big courses like histology (about 6 credits) which consists of a large portion of laboratory work, be it in the regular microscopy or virtual labs. Studies looking

at exclusively online laboratory courses in higher education have also shown promising results (Gilman, 2006), especially when using discussion boards and synchronous online conferencing to increase instructor feedback, along with the incorporation of collaborative assignments to increase student-student interaction. In fact, approaches to assessment need to be harmonious and should ideally include feedback mechanisms as well as diverse forms of assessments: self, peer, co-assessment and instructor assessment to name a few.

This article aims to highlight the important role of online assessment and feedback in the effective implementation of medical curriculum in general, and particularly within histology.

Assessment:

It has long been considered that assessment drives learning. Further, self-assessment, peer evaluation, portfolios of learner's work, written assessment of reasoning, standardized examinations, oral examinations and sophisticated simulations are used increasingly in histology to support students to be able to fulfill the curricular objectives (Jurjus et al, 2013; Evans et al, 2014). Histology, which is a relatively large course, equivalent to 6 credits in some curricula, benefit a great deal from this diversity of assessment methods. In fact, almost all these modalities could be practiced online providing rigorous preparation and may drive the learning process more efficiently. Multiple types of assessments have been described using a variety of approaches including formative and summative assessments which constitute 2 different uses of assessment rather than different types of assessment: However, they have important things in common. Both involve some form of judgment of the students' work and attainment. When student work receives comments intended to guide future work as well as a mark or grade which will affect the student's progression or final award, the assessment is then both formative and summative. The provision of formative assessment has been recognized as a significant benefit to student learning through familiarizing students with the levels of learning required (Barbeau et al, 2013; Rauf et al, 2014).

Given the importance of assessment in learning, students need to learn about it to clarify "the rules of the game," i.e., assumptions known to teachers but that are less transparent to students. Good practice would dictate that assessment strategy needs to be clear from the start and well delineated in the syllabi of courses. It is our opinion that syllabus` should include: (1) The criteria forming the basis of awarding grades to students,

(2) Involving students in generating or applying criteria after clarification of assessment criteria, and (3) The marking process itself from the perspective of both the tutor and the student.

Taking into consideration the impact of assessment on student success or failure in higher education, online assessment dialogues have an important role to play in reinforcing the assessment process; from design to summative feedback. Failure to perform such dialogues may lead to negative consequences such as student dissatisfaction and/or poor retention (Yorke 2001). Indeed, engaging students in assessment and feedback practice could enhance students' awareness and understanding of learning outcomes and assessment criteria; factors which may positively foster performance, maximize enthusiasm and thus engagement (Evans et al, 2014).

The type and frequency of assessment is therefore possible to influence the caliber of learners we produce. If histology assessment is largely to remain in the form of multiple choice questions, testing volumes of factual knowledge, even those students who are usually deep learners may be forced to become surface learners. With an integrated and innovative curricula, a mixture of strategies and activities such as case-based, team-based or problem-based learning, virtual microscopy, appropriate online assessment methods (both formative and summative) measuring intended learning outcome should aim to be developed by educators to engender more transformative conceptions of learning (involving reflection and self-development).

The importance of assessment in influencing student learning cannot be under-estimated. The authors are of the opinion that assessment is possibly the most important influence on student learning processes and outcomes. We consider the "appropriate assessment" as one of the major principles of effective teaching in higher education. Examination questions that do not encourage understanding risk giving students the message that surface learning approaches will be rewarded. Equally, the opposite also holds true. If students anticipate that test questions require understanding then they will be encouraged to adopt a deep learning approach, thus facilitating the retention of knowledge after the learning period and be able to use and rely on a full understanding of that knowledge in their chosen career (Sugand et al, 2010).

Students need also to develop individual approaches to come to terms with Histology, constructing their own mental images of structures which allow them to differentiate one tissue from another. We encourage students to do this by relating structure to function,

hoping they will integrate biochemistry and physiology learning with histology and even pathology learning within one clinical scenario. Such integration would constitute an appropriate subject for online assessment. In this case, a collection of various formative assessments designed and introduced into each of the system-based modules which make up the basis of the first 2 years of the medical program. Histology would feature as an inter-woven element throughout each of the system-based modules and would be delivered using a multi-faceted approach based on virtual microscopy (Evans et al, 2014).

Feedback:

Effective feedback is both appropriate and timely (Ramsden, 2003). It is defined by its ability to inform, in a constructive way, the progress of the students through their studies providing a clear sense of how well they are doing and what they might need to do to improve. To reach this ideal, feedback should be understandable, timely and acted upon by students and educators (Gibbs and Simpson 2004).

Feedback has long been recognized by educators as central to student learning processes in the development of effective learning playing a decisive role in learning and development, within and beyond formal educational settings. Actually, we learn faster and better when we are aware of what we might need to do to improve. Timely feedback can serve multiple purposes; besides being part of academic life, it provides advice for improvement of the current and future assignments as well as justifying the grade. In our teaching of Histology, feedback has served efficiently by indicating to the students how well they performed in their learning and to professors how successful they were in conveying the appropriate educational message.

Extensive efforts have been deployed recently to compare the effectiveness of traditional course formats to online alternative formats. They showed that assessment and feedback were at the heart of the student learning experience and had a dominant influence on the way students learn (Nicol & Macfarlane, 2006).

Therefore, prompt and effective feedback constitutes, as it comes online, a key issue in promoting student learning, while in general, slow feedback could contribute significantly to stress, to increase in drop-out rates and even quitting education (Race, 2007).

Staff spending many hours marking and writing constructive feedback have also expressed their frustrations and some students

recognize the problems staff face in returning feedback quickly but their feelings of frustration override their thinking leading to expression of negative comments in surveys. However, other studies concluded that it was not an issue of equal significance to all students. An array of students' opinions was expressed along this line and as demonstrated by Poulos and Mohoney (2007), the effectiveness of feedback extends beyond the mode of delivery and timelines. Fast feedback (provided online) leads in general, to short turn-around times, addressing an issue with multiple purposes and benefits in courses like histology (Barbeau et al, 2013). Actually, fast assignment turn-around seems most critical for students who are involved for the first time with a particular course to actively engaging them in the learning process. In addition, prompt turn-around seems to be more significant for students whose assignments have sequential relationship like in histology whereby cytology and basic tissues are offered in the early sessions. The organs and organ-systems histology will therefore be able to follow on a more solid basis. However, students who are confident and autonomous learners also tend to be less concerned with prompt feedback than their less confident, inexperienced counterparts. However, the diversity of students entering the medical field and taking histology is increasing and their approaches to learning and their learning styles are expected to be enriching if properly channeled and guided through well designed, fast and individualized online assessments and feedbacks (Evans, et al 2014).

In brief, prompt feedback is a significant indicator of a satisfactory result and a justification of marking decisions. It is also feasible to be done on-line and very relevant to histology, where students appear particularly dependent on rapid return of their assignments.

In line with the current wave of transforming medical curricula into organ-system based integrated teaching modules, and with the massive growth of classes and online course enrollment, fast feedback and assessment, on-line or otherwise, are becoming an urgency. Some of the courses are short, they last for 3 or 4 weeks and if left without fast and periodic feedback, the students might lose the thread of context and do not know where they stand until it is too late. Fast feedback will provide the benefit of direct observation, instruction, coaching and assessing the students who also have time for self-reflection and for their own professional development (Cooke et al, 2006). Actually, the most important factor in the success of formative assessment is the quality of feedback, proven to result in a maximum impact on student accomplishment (Rauf et al, 2014).

In describing helpful feedback, Walker (2006) stressed that a

balance between positive and critical feedback is required to make students confident. This balance guides the student on how to improve performance against the assessment criteria. Moreover, the effectiveness of the feedback also extends to the credibility of the teacher and ultimately to the educational system. It is the responsibility of the tutor to ensure that feedback is timely, understood, and constructive by offering indicators of what students can do to improve. Research data support learning interventions taking as little as 90 minutes to be a powerful and cost-effective strategy for enhancing the process of learning.

Feedback Strategies:

Educators resorted to a number of feedback strategies that could be considered as lightening the burden of marking and reducing the feedback time. These strategies include:

1. Computer Aided Assessment (CAA). This form offers staff and students a mechanism for providing rapid feedback. Evidence proved that students and staff are benefiting from the use of CAA provided through the Black board and the Question Mark online testing systems among others. These modalities are applied in histology in various medical schools.

2. Use of statement banks and electronic templates. These mean that staff can speed up compiling of feedback and contribute to the quality of feedback (Heinrich et al., 2008).

It is very important to note that some studies showed that students, and to some extent teachers, perceive the lack of useful and timely feedback as a problem in the assessment process (Sugand et al, 2010; Jurjus et al, 2013; Evans et al, 2014). However, adopting an on-line feedback mechanism in our histology and anatomy courses would offer a great advantage in this context.

Discussion:

As on-line education expands to become more mainstream, one important question for we as educators still awaits an appropriate answer; "How do I know what my on-line students have learned?" In addition, the growing demand for lifelong independent learners and reflective practitioners has stimulated us as educators for a periodic re-evaluation of the relationship between learning assessment and feedback. Not only that, new trends in higher education have

influenced to a great extent, the development of new assessment forms such as self-, peer-, and co-assessments. One might say this is actually a new era in assessment pedagogy, with the sector aiming to replace passive testing activities with forms of assessment that promote integration of learning and instruction; examples of teaching strategies that respond well to this strategy include team-based learning, problem-based learning, as well as interactive virtual microscopy and case discussions. Their use is increasing as appropriate teaching strategies in histology courses. It is pertinent to note at this point that many new assessment methodologies conceive the student as an "active" person who shares responsibility, reflects, responds to feedback, collaborates and conducts a continuous dialogue with the teacher. As an appropriate vehicle, the on-line process has likely facilitated an effective way to reach learning objectives and an efficient method of implementing the respective strategies and activities leading to the intended outcomes.

Actually, the goals of higher medical education have been undergoing continuous revision over the past two decades, especially after the second Flexner's report (Cooke et al, 2006; Jurjus et al, 2013). In recent years, new methods in line with developments of new scientific knowledge and modern communication technology have been implemented. These new methods stress problem solving skills, professional skills, and learning in real-life contexts. It is conceived that medical students taking up positions in modern organizations need to be able to reflect critically upon their practice (Kwan & Leung, 1996), to analyze information, improve their problem-solving skills and communication, and to reflect on their own role in the learning process. In brief, students are expected to become lifelong learners (Sambell & McDowell, 1997) trained on evidence based medicine throughout their medical curriculum (inclusive of histology) and to make efficient use of on-line learning resources and modalities including on-line assessment and feedback.

In Europe, USA, Australia and other countries, education experts are rightfully considering that the era of testing has changed into an era of assessment and feedback (Birenbaum, 1996). These are valuable tools not only to alert and guide students but also to improve courses and curriculum including histology and other anatomical and basic sciences (Sugand et al, 2010; Rauf et al, 2013; Jurjus et al, 2013).

Assessment is being considered, within histology as well as elsewhere, as a pluralistic approach using authentic tasks (Segers, 1996; Evans 2014). Assessment providers can serve as tools for crediting students with well-defined evaluations as well as for monitoring directly students' progress and directing students to remedial

learning activities through timely feedback. In brief, assessment is now being considered as a tool for learning, it definitely goes beyond measuring the reproduction of knowledge and passing the test. Research findings concerning assessment indicate that the use of the combination of self, peer, and co-assessments, which could be well achieved on-line, are effective and lead to more accuracy (Horgan et al, 1997). Self and peer assessment can also be used for summative purposes as a component of co-assessment whereby the tutor also retains the authority to express the final decision about a grade. Such a collaborative assessment, especially when done on-line, removes the student / tutor barrier leading to greater motivation and better learning (Somervell, 1993). The challenge for course directors is to find the right combination that works best for their course.

In our histology courses, assessment and feedback to and from the students are acquired through filling on-line forms, face to face discussion oral exams as well as National Board of Medical Examiners (NBME). In the future, our plans are to add more elements of assessment and feedback such as:

1. Assessing whether online learners can align learning objectives with real-life applications better than the paper based or face to face approaches.

2. Adopting strategies for creating better and validated multiple-choice tests with online assessment and feedback like the NBME.

3. Using self-check exercises to assess online learning

4. Measuring the effectiveness of an online learning community

It is believed that designing and developing on-line assessment and feedback strategies would lead to more and better documented findings. In the end, the goal of learning assessments should be to measure whether actual learning outcomes match desired learning outcomes. The gold standard for assessment of quality is therefore validity. A valid assessment should measure what it claims to measure. However, inadequate learning assessments can be frustrating. At worst, it can defeat the students and institutions in reaching their goals.

Conclusion:

Could the online approach make learning better in histology? More work is needed in this regard, however, reported data support well-defined on-line instructional and learning techniques making teaching more effective. Such techniques can be introduced slowly and methodically, at the same time as on-line assessment and feedback without compromising coverage of the syllabus, thereby promoting the learning process. These activities are more economic and require less expenditure of money, time, and effort. Most importantly, on-line learning, assessment and feedback have been validated by documented and repeatable research and as such, their effectiveness is not simply a matter of opinion. They work well in histology (Barbeau et al, 2013; Jurjus et al, 2013) and contribute to maintaining high educational standards.

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